to achieve the same clinical end point)? My anesthesiologist colleagues suggest that this would be unlikely, as clinical response to fentanyl varies so from patient to patient.

The laboratory plays a key role in identifying nosocomial infection, and laboratory participation also can be important in dealing with noninfectious adverse events in hospitals like drug theft. Measuring fentanyl drug levels in health care professionals suspected of stealing this opioid, as suggested by Maki et al, would seem reasonable when suspicion is based on strong data like those presented in this report. On the other hand, fentanyl and similar drugs are difficult to detect in body fluids, as the methods needed for qualitative assay have been insensitive and technically demanding. Random testing of syringes or vials for their content of drugs like fentanyl would permit noninvasive monitoring; however, such testing would require quantitative assays, and these have been even less feasible than qualitative tests. At present, then, routine testing for this drug seems impractical. This situation may change, as better assays are being developed.[8]

New methods have been described for monitoring the distribution to and use of narcotics in the operating room.[9,10] Perhaps expansion of these approaches will permit surveillance for drug theft while drug assays are developed to attack this issue more directly. Meanwhile, when problems like this occur, the tools of the hospital epidemiologist remain useful in finding the answer, whether it is a solution or not.

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New Pathways for Medical Education

It is timely and encouraging to note the appearance, in this issue of THE JOURNAL, of an article on reform of medical education.[1] The editors deserve credit for featuring an article on medical education, and the authors merit praise for designing and carrying out a careful assessment of the opinions of teachers and administrators about reform.

See also p 1002.

Dr Cantor and his coauthors conclude that there is "a restlessness among leaders of medical education" consulted in their survey. They note that "except for basic sciences faculty, a majority of educators stated that 'fundamental changes' are needed in medical student education in the United States." What are the origins of these feelings of concern in the minds of those who are responsible for educating the physicians for the future?

The authors cite several criticisms that have been made of contemporary medical education. In my opinion, the prevalent anxiety of medical educators is provoked not only by these criticisms, but by the underlying rapid changes in the conceptual framework and the practical organization of medical practice.

The most powerful force driving these changes is the deepening understanding of the human situation informed by discoveries in physics, chemistry, and biology of man. The emergence of molecular and cell biology is creating a view of human health and disease that is without precedent. We begin to recognize the connections between specific chemical abnormalities in genes and proteins and clinical disorders. We are learning that certain syndromes such as diabetes mellitus and hypertension can result from many different chemical and cellular errors. We are becoming more aware of the subtlety of molecular attack by microbes and of the insight that human disease is also biological evolution in action.

These scientific advances have spawned inventions of technology that improve the diagnosis, treatment, and prevention of disease. The skillful use of these new technologies has required the elaboration of more subspecialties in medicine and surgery. Effective medical practice requires cooperation among many different kinds of subspecialties working in groups. The manufacture and distribution of the new technical tools used by physicians is the work of a rapidly growing medical and health care industry, operating in parallel with the medical profession. Private and public third-party insurers have entered the economic relationship between patient and doctor as well as between patient and hospital. Employers increasingly represent their employees in arranging not only for health insurance, but also for specific providers of medical care. The increasing costs of health care that arise from the ever greater technical complexity and power of the tools that physicians use have moved public and private employers and insurers to exact more cost-effective behaviors from the medical profession. Patients are more often inclined to litigate when the outcome of a transaction with a physician

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does not produce the desired result. The power of modern molecular medicine raises profound ethical issues, particularly concerning the beginning and the ending of life.

From the point of view of medical educators, all of these accelerating changes in the science, technology, and organization of medicine increase enormously the mass of information relevant to the work of physicians. Yet neither the amount of time devoted to preparing for the MD degree, nor the storage capacity of the minds of students, has changed. The problem of choosing the knowledge that all persons entering the field should master becomes steadily more difficult. Moreover, most members of medical faculties are experts in the various subspecialties who are anxious to impart their special knowledge to their students. It is not surprising that medical professors feel frustrated and are searching for new ways to learn medicine. Many of these observations about the challenges facing medical education have been developed in greater detail elsewhere.[2-4]

If these are the main reasons why medical educators are restless, why haven't they changed the system to reduce their frustrations? The question is particularly compelling since many of the problems were recognized long ago[5] and several thoughtful remedies have been attempted.[6-9] In my opinion, there are both conceptual and organizational reasons for the resistance of US medical schools to change the curriculum leading to the MD degree.[10]

On the conceptual side, as noted above, it is not easy to choose the knowledge, attitudes, and skills that all physicians should develop while they are in medical school. Moreover, devising the process that will be most effective in promoting these developments is also a formidable task. However, as noted by Cantor et al,[1] certain directions of reform seem sufficiently clear to enlist the support of most medical educators. These include a greater emphasis on the development of the attitudes and skills that will sustain a lifetime of learning; more attention to independent problem solving; fewer didactic, large lectures; greater integration of basic science and clinical phases; more clinical education in ambulatory and community settings; and development of a system for evaluating and rewarding faculty members for excellence in teaching. Given this relative consensus, it is even more surprising that reform is moving so slowly.

As noted by Bloom,[10] there are many reasons for the high resistance to change in medical education. To my mind, the most important factor is organizational. In most medical schools, no group in the faculty has the responsibility to design and provide the entire sequence of experiences that students must engage in to prepare for the MD degree. The department chairmen might have fulfilled this role when their departments were small enough so that they could spend enough time on the issues of helping students learn medicine. If that was ever the case, it is no longer in most medical schools. Rather, the departments have grown larger and have become preoccupied with research and education related to their many subspecialties. The result has been a dysfunctional fragmentation of the program of general medical education.

In my opinion, significant lasting reform requires the creation of new faculty organizations that exist primarily to carry out the program of general medical education. The survey done by Cantor et al[1] addressed this issue by asking respondents whether they favor assigning "authority and budgetary control necessary to develop and administer the educational program" to a small group of faculty and deans. It is noteworthy that this proposal was supported by only half of the respondents. About equal numbers strongly supported and strongly opposed the move. Perhaps the result would have been more supportive if the emphasis in the proposal was not on a single "small group of faculty and deans" but rather on *groups* of faculty members. In the New Pathway for general medical education at Harvard Medical School,[4] we have addressed this issue by forming five academic societies that bear responsibility for the integration of the program of general medical education. It is my hope that the "restlessness" among medical educators noted by Cantor et al[1] will lead faculties of medicine throughout the world to explore different patterns of organizing to plan and carry out general medical education.

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